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Comparative Effectiveness of 0.25% Turmeric Extract Cream and Grated Turmeric on Skin Elasticity Turmeric (Analysis of Curcuma Longa Concentration in Topical Preparations)

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Abstract

Turmeric as an antioxidant has been emerging studied for its many uses, especially for the health aspect, especially in counteracting free radicals. This study aims to determine the effectiveness of 0.25% turmeric extract cream and grated yellow turmeric (*Curcuma longa*) in improving skin elasticity after skin application for 21 days. The experiment was conducted in a Hasanuddin University Hospital in Makassar from March 2017-April 2017. Prospective cohort method was preferred in an observational analytic study. The subjects are women aged 30-50 years old who visited the dermatovenereology outpatient department of Hasanuddin University Hospital. A total of 13 subjects are given 0.25% turmeric extract cream, grated yellow turmeric, and vitamin C creams for the control group. All the cream was applied once a day on the right arm above the appropriate marker that has been given. The same method was applied twice daily in the upper left arm. On day 8 and day 21 skin analyzer was used to measure the skin elasticity following cream application.

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The results showed no significant changes between the 0.25% turmeric extract cream and grated yellow turmeric applied once and twice a day. However, there is a tendency of increasing skin elasticity score on day 21 of 0.25% turmeric extract group.

Keywords: yellow turmeric (*curcuma longa*); 0.25% turmeric extract cream; skin elasticity.

1. Introduction

Skin is the largest human organ. The skin continues to reconstruct itself to ensure its survival, integrity, and ability to provide protection for the body. Some areas of the skin are continually exposed to a variety of environmental stresses, directly and indirectly [1]. The outer skin layer (epidermis) always grows and peels back. The three most important functions of the epidermis are environmental protection (barrier function), prevention of dryness, and skin immune system. Stratum corneum is a very important skin barrier that protects the body from toxin and dryness [2]. Extracellular matrix (ECM) in the dermis area of the skin consists of, among others, fibroblasts and proteins including collagen and elastin [3]. Oxidative stress and environmental factors contribute to the molecular damage to the skin. The major signs of aging can be classified into four major categories of wrinkles / textures, lack of elasticity, vascular disorders, and pigmentation. Skin elasticity often appears as wrinkles where there is damage to basal cell structure and degradation of the protein matrix [4]. Collagen has a close association with skin elasticity. Procollagen type 1 and ECM often decompose and elastin expression is often inhibited by matrix metalloproteinase (MMPs), then will induce activating protein 1 (AP-1), transcription factor, MMP-1 and 8 which are known to degrade collagen [5]. Ultra Violet radiation (UV) radiation, along with many other factors that are constantly exposed to the skin, such as smoke and microorganisms, can lead to skin aging, hyperplasia, erythema, and can even cause cancer. Excessive exposure to UV radiation can indeed cause inflammation, oxidative stress, and DNA damage, dysregulation of cellular signal pathways, and immunosuppression, both directly or through the generation of reactive oxygen species (ROS)[6]. To prevent such damage, the skin has a defense mechanism: the main protective systems including melanin pigments, which absorb and spread UV radiation and antioxidant enzymes and nonenzymatic molecules including Coenzyme Q10, carotenoids and vitamin C, which are able to counteract the adverse effects of oxidative stress on skin that is constantly exposed to radiation [7]. Free radicals are opportunistic superoxygen molecules, which circulates in the bloodstream and always ready to damage weak and disturbed cells. Free radicals in the body results from metabolic processes, as it can also absorbed from outside the body through the respiration or skin. The use of natural materials as traditional medicine in Indonesia has been done by our ancestors since many centuries ago as evidenced by the existence of old manuscripts on palm leaves Husodo (Java), Usada (Bali), Lontara pabbura (South Sulawesi), Serat Primbon Jampi documents, Serat Racikan Boreh Wulang Dalem and reliefs of Borobudur temple depicting people are mixing medicine (herbs) with plants as raw material. One of the plants that is widely used as a traditional medicine is turmeric (*Curcuma domestica*). Turmeric is one of the Zingiberaceae plants. The most important part in utilizing turmeric is the rhizome, however, turmeric leaves are widely used for various types of cuisine, since it can eliminate the smell of rancid and add to the aroma of cuisine. Turmeric as an antioxidant has been emerging studied for its many uses, especially for the health aspect, especially in counteracting free radicals. Unconsciously, our bodies are continuously creating ree radicals through normal metabolism, inflammation, malnutrition and in response to

external influences such as pollution, ultraviolet, cigarette smoke, and others. Therefore, the body needs an important substance such as an antioxidant in order to help protect the body from free radicals by reducing the negative impact of this compound. This study will use active substances derived from natural ingredients, namely yellow turmeric extract (*curcuma longa*) which is known to contain flavonoids and curcumin that are able to absorb UV A and UV B. Curcumin is well-known to have important biological activity especially its antioxidant activity of hydroxy aromatic terminals, beta-diketone constituent and double bonds which possesses anti carcinogenic and anti mutagenic properties. Natural ingredients are more beneficial as they have better tolerance on the skin, thus cause less irritation on sensitive skin. Previous study by Martelli and his colleagues (2007), reported that the curcumin extract can regenerate skin cells, but has never done research on turmeric extract in topical preparations in improving skin elasticity. Pursuant to that matter, hence writer was interested to conduct this study in order to value the effectiveness of 0.25% turmeric extract cream and grated yellow turmeric (*curcuma longa*) in repairing skin elasticity after skin application for 21 days.

2. Material and Methods

2.1 Time and Place

The study was conducted in Dr. Wahidin Sudirohusodo Makassar Hospital, University of Hasanuddin Hospital and other networking hospital in Makassar as sampling points. The study was conducted from March to April 2017.

2.2 Design Study and Variable

Prospective cohort method was preferred in an observational analytic study. The research variables consisted of: free variables (0.25% yellow turmeric extract and yellow turmeric grated), dependent variable (skin elasticity), and confounding variables (age, pregnancy, allergy).

2.3 Subjects

The study population are women aged 30-50 years old who visited the dermatovenereology outpatient department of Dr. Wahidin Sudirohusodo Makassar Hospital, University of Hasanuddin Hospital and other networking hospital in Makassar. The study sample was the entire affordable population who met the inclusion criteria.

2.4 Sampling Methods

The data collection was performed by: a) interview / anamnesis done through the designed questionnaire. The interview intends to collect data on the identity, characteristics and history of the disease in the sample. b) Physical examination was conducted to assess the elasticity of the skin by using a skin analyzer on the upper arm as a standard, the results then recorded and documentation was performed during the measurement.

2.5 Data Analysis

Data analysis was performed using SPSS version 22. The statistical test used was Kruskal-Wallis test. The test results are significant if the value of p test <0.05 . study is a descriptive research that assesses the variation of environmental temperature, humidity, rainfall and wind speed in three dengue fever endemic areas in the year 2006 in South Sulawesi that consist of Makassar Municipality, Maros and Gowa Regency. Compilation of the study data within the dengue fever endemic areas in South Sulawesi were taken from Health Office of South Sulawesi provinsi, whereas the data of environmental temperature, humidity and rainfall were collected from Hall of Metereology and Geophysics. The overall data were represented in the form of tables that display minimum, maximum, mean and probability values.

3. Results

An analytic observational study was conducted using prospective cohort method to value the effectiveness of 0.25% turmeric extract cream and yellow grated turmeric (*curcuma longa*) in improving skin elasticity after skin for 21 days. The study was conducted in Dr. Wahidin Sudirohusodo Hospital Makassar, Hasanuddin University Hospital and other networking hospital in Makassar from March to April 2017. Subjects studied were 13 people, with female gender, aged 31-37 years with a mean of 33.6 ± 1.8 years. Comparison of elasticity score on Application 1 is the group applied once daily. Application 2 is the group that is applied twice a day. Group 1 for turmeric grater, group 2 for 0.25% turmeric extract cream, and group 3 for vitamin C cream control. Elasticity 0 is a day elasticity score 0, Elasticity 8 is elasticity at day 8, and elasticity 21 is elasticity day To 21. Measurement of elasticity by using skin analyzer in the form of score, with lowest to high that is very low (1), low (2), normal (3), high (4) and very high (5). In the Kruskal-Wallis test the test results are significant if the value of $p > 0.05$. In the once-daily application group on the results obtained on day 8 there was no significant difference in skin elasticity ($p = 1.000$). On day 21 it was found that there was no significant effect on skin elasticity ($p = 0.941$). However, the highest scores in each group were used by mean, where the higher score means improved skin elasticity. On day 21, the highest elasticity score in turmeric cream group (2.54) was higher than pure turmeric (2.38) and control (2.38) (attachment, Table 1).

Table 1: Elasticity Score Comparison on 1 time Application

Variables	Group	N	Minimum	Maximum	Mean	SD	p
Elasticity Day 0	Kunyit Murni	132	3	2,38	0,51		
	Krim Kunyit	132	3	2,38	0,51		
	Control	132	3	2,38	0,51		1,000
Elasticity Day 8	Kunyit Murni	132	3	2,38	0,51		
	Krim Kunyit	132	3	2,38	0,51		
	Control	132	3	2,38	0,51		1,000
Elasticity Day 21	Kunyit Murni	132	3	2,38	0,51		
	Krim Kunyit	132	4	2,54	0,78		
	Control	132	3	2,38	0,51		0,941

Source : Primary Data

In the application group twice daily in the results obtained on day 8 there was no significant difference in skin elasticity ($p = 1.000$). On the 21st day there was no significant result on skin elasticity ($p = 0.076$). To see the elasticity scores of each group on the 21st day get the highest elasticity score in the turmeric cream group (3.08) higher than the control (2.85) and pure turmeric (2.38) (attachment, Table 2).

Table 2: Elasticity Score Comparison on 2 times Application

Variables	Group	n	Minimum	Maximum	Mean	SD	p
Elasticity Day 0	Kunyit Murni	132	3	2,38	,51		
	Krim Kunyit	132	3	2,38	,51		
	Control	132	3	2,38	,51		1,000
Elasticity Day 8	Kunyit Murni	132	3	2,38	,51		
	Krim Kunyit	132	3	2,38	,51		
	Control	132	3	2,38	,51		1,000
Elasticity Day 21	Kunyit Murni	132	3	2,38	,51		
	Krim Kunyit	132	4	3,08	,76		
	Control	132	4	2,85	,90		0,076

Source : Primary Data

Comparison between once daily and twice daily application score, better results obtained on the twice daily application in the cream turmeric extract with value of 3.08 (application 2 times) and 2.54 (application 1 times). In the grated turmeric group there was no change with the same elasticity score in the once application and twice application group with the value of 2.38. In the control group (vitamin C cream) the twice application group value was 2.85, which is better than once daily application with the value of 2.38.

4. Discussion

This study revealed that there was no significant change between 0.25% turmeric extract cream and turmeric yellow grater applied once and twice daily. However, there was a tendency in increased skin elasticity score on day 21 in the group using 0.25% turmeric extract.

The sample was female, since one of the factors causing premature aging is hormonal especially in women such as estrogen, progesterone, testosterone, DHEA, pre menopause and menopause that can cause premature aging. All of these contributes in making the skin less smooth and dull. Research conducted by Winarsi and his colleagues (2013), found that in general women are more worried about the aging process than men, hence it is important for women to inhibit the aging process, one of them by controlling the formation of free radicals. Topical medications consist of the vehicle and the active ingredients. Currently, the number of available topical preparations is aimed at obtaining maximum efficacy of the drug's active ingredients and providing the best

alternative form of dosage form. Topical medication is one form of drug that is often used in dermatology therapy. Cream is a semi-solid dosage form containing one or more dissolved or dispersed ingredients in an appropriate ingredient[8]. This study used a 0.25% turmeric rhizome extract in cream preparations, when compared with pure turmeric grater, in obtaining better skin elasticity by using turmeric extract in cream preparations. The statistical test showed that the elasticity of skin elasticity increased as several samples of the study had undergone changes in skin elasticity score on the 21st day. In addition, the active ingredients must be inside the carrier substance[8]. Examination of active substance from turmeric extract has also been done in this research, using spectrophotometric method in obtaining the content of curcumin active substance contained in a 0.25% turmeric cream extract of 17.913%. The research of cream penetration was done by Lucida and his colleagues (2007), it was reported there is significant difference in penetration of Virgin Coconut Oil in cream preparation. Prabawati (2015), also examined penetration of kencur rhizome in cream preparations was better than ointment, but lower in gel preparation. Setiawati (2016), using a 0.25% turmeric extract cream reported a significant result in improving the brightness of the skin in comparison to pure turmeric grater. This study also revealed penetration of 0.25% turmeric extract cream is better when compared with pure turmeric grater if directly applied to the skin. The statistical test showed that the elasticity of skin increased as several samples of the study had undergone changes in skin elasticity score on day 21. Topical vitamin C is one of the antioxidants that have been widely studied in improving skin elasticity and stimulate the formation of collagen. In addition, vitamin C has been shown to improve skin that has undergone photodamage, increased collagen synthesis, and inhibits MMP1 thus decreasing wrinkles, and inhibiting tyrosinase. The results of this study were not significant because the observation time was too short. Therefore, for further research in observing changes in skin elasticity should takes more than 21 days. Collagen is associated with skin elasticity. Procollagen type 1 and ECM often decompose and elastin expression is often inhibited by matrix metalloproteinase (MMPs), these will induce activating protein 1 (AP-1), transcription factor, MMP-1 and 8 which are known to degrade collagen[5]. UV light and the production of reactive oxygen species cause skin aging and cell damage by attacking the plasma membrane, resulting in loss of elasticity function, hence the skin becomes stiff, inelastic, and causes skin wrinkles. Antioxidants themselves are known to bind and neutralize free radicals, reduce peroxide concentrations, and repair membrane damage due to oxidation. In addition, they also functions as a cell regulator and can affect the metabolism and production of collagen directly. Martelli and his colleagues (2007), examined the use of curcumin with a concentration of 0.0005 and 10% of the total weight of the composition for cosmetics, with conclusion that it can repair skin cells and regenerate skin. Curcumin is a major element that raises yellow color in turmeric and has been isolated from various species of curcuma; *C.longa* Linn, *C.xanthorrhiza* Roxb, *C.wenyujin*, *C.sichuanensis*, *C.kwansiensis*, *C.aeruginosa* Roxb and *C.elatha* Roxb. *C.longa* L / turmeric has the highest curcumin content than any other species. Various effects of curcumin have been found, including as scavenger of reactive oxygen species. Curcumin is an antioxidant to various ROS including superoxide anion, hydroxyl radical, singlet oxygen, nitric oxid and peroxyinitrite. Curcumin has protection capability; lipids, hemoglobin and DNA against oxidative degradation. Turmeric (*Curcuma domestica* Val) is one of five plant species developed as indigenous medicinal plants of Indonesia. Part of the rhizome is used as raw materials for traditional medicine industry, kitchen spices, cosmetic ingredients and refreshments. Empirically turmeric is effective as anti-inflammatory (anti-inflammatory), ciculatory, facilitate labor, carminative, anti bacteria, helps bile excretio, and as an astringent. There have been many studies on plant

and extracts of both the component and its derivatives that have antioxidative properties. Curcuminoid contained in turmeric as one of the isolated compounds and its curcumin has a very wide activity, such as anti-oxidants, anti-hepatotoxic, anti-inflammatory & anti-rheumatism. Curcumin extracted from turmeric plants also shows the ability to protect against UV, which acts as an anti mutagenic, antioxidant, anti-inflammatory and anti-carcinogenic[9]. The use of herbal ingredients in cosmetics are increasingly in demand and predicted to be a trending issue as the materials come from nature tend to be safer[10].

5. Conclusion

The researchers concluded that 0.25 turmeric extract cream was not proven significantly for 21 days in improving skin elasticity score in the measured with skin analyzer, but found a tendency to increase skin elasticity score. Turmeric extract is better given in the form of cream rather than pure turmeric grater. The frequency of application is better given twice a day. The researchers suggested that further research could assess the elasticity of skin changes over a longer period of time. The next research can consider to use turmeric extract in the form of gel.

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Competing Interest

The authors declare that they have no competing interests.

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